Improving economic efficiency to produce quality hatching eggs

Achieving quality hatching eggs is the end goal for all breeding operations. Management of the hatchery is obviously critical in ensuring a solid hatch and good start for the chick, but predominantly, quality starts with the parent stock. Quality can mean several things, from hatchability to shell strength to chick viability and offspring performance. One factor that can influence all of these is breeder gut health.

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The gastrointestinal tract has direct links to overall bird immunity and health status, and if gut health is poor, then performance will suffer. As such, managing the intestinal health of breeding stock is imperative. Breeding can be related back to biological efficiency; feed is being converted into chicks by the breeding flock.

So, anything detrimental to the conversion efficiency, like mortality of breeders, a low degree of fertility or any non-hatching eggs at the hatchery, can be considered a loss. Breeding and hatching chicks is a business, and as such, loss comes at a cost. Bird uniformity, improved egg production and sustainable performance all improve business profitability.

Body weight and feed efficiency

Maintaining the sustainability of egg production in breeding flocks, and hence quality offspring output is directly related to controlling bird weight.

Broiler breeder flocks are, by their nature, birds that gain body weight easily. However, if females become too heavy, they cannot sustain their egg production because the hierarchy of ovarian development alters.

Likewise, if males become too heavy, their fertility can be affected. In order to control weight gain, birds are often fed in cycles of meals, meaning that the gut goes through periods of overload followed by periods of fasting.

This can impact gut health. Meal feeding causes issues in the GI tract, as the birds feed quickly, meaning intake is rapid.

Therefore, food throughflow is fast, meaning there is less opportunity for the breeding bird to digest and absorb feed efficiently. When feed is not digested fully, it passes through the gut to the caeca. The caeca are the site of fermentation, and providing high-density nutrients to the microbial population there allows them to replicate quickly and produce toxins. This often leads to caecal wall damage and subclinical enteritis in the small intestine through retroperistalsis of the toxic products.

To try and manage this, undigested feed and subsequent gut health status can be monitored through the faeces. Feed particles in faeces are an easily identified means of tracking the efficiency of digestion and absorption. But even to the untrained eye, the texture and colour of droppings can provide a good understanding of what is going on inside the birds.

One means of monitoring faeces is through Alltech's manure scoring app, which provides an easy-use and educational way of tracking changes in the flock by looking at the faeces.

Immune function and gut microbiota

As mentioned above, gut health directly influences the immune status of the bird. It is estimated that 70% of the immune system functions through the gut, as this is the main port of entry for pathogens. Offspring acquire their initial immunity via passive transfer of maternal antibodies through the egg. So, immune status of the breeding flock will directly influence the viability and early mortality of the offspring.

The functioning of the immune system is a complex topic however. Multiple research papers highlight the role of selenium's antioxidant properties in ensuring its efficient function. Breeder birds undergo a strenuous vaccination programme in order to benefit themselves and the offspring. However, repeated vaccination can be immunologically stressful and, as such, maintaining weight and general health status to keep uniformity of flocks is difficult.

Inflammation from vaccination or stress from other factors will directly impact the microbial population in the gut by releasing chemical messages and negatively impact output and performance.

As such, managing the microbial population in the gut, or microbiota, is an important step towards managing immune status and breeder bird performance. The microbiota influences both digestibility of feed and immunity, and organisms in the gut excreted in faeces form a vital part of the house flora. This flora is then passed down from parent stock to their offspring through vertical transmission.

Hatchers are cleaned and disinfected but are contaminated via egg shells through incubation. When chicks hatch, their gut is nearly sterile, with a few micro-organisms from the mother colonising the gut. However, as they break from their shell, any organisms on the external surface will transfer into the chick, and due to a lack of competition, begin to colonise. The microbiota goes through multiple phases throughout the life of both the breeder bird and the chick, from pioneer species to

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climax colonies. Accelerating the evolution of the parent stock microbiota and maintaining it in a balanced and diverse state will ensure that organisms passed down to the offspring are beneficial. In addition, ensuring a well-balanced microbiota will allow the breeding bird to develop immune resilience, allowing them to divert energy into performance and not into immune responses.

Maximising antibody transfer and reducing inflammatory responses is a significant contributing factor to an efficient breeding flock and producing quality chicks – which can all be controlled through promoting a beneficial flora. So, how do we produce a healthy, diverse and well-balanced microbiota?

Seed, Feed, Weed programme

Meal feeding in breeding stock starts soon after placement in the production house. As a result, accelerating the microbiota to reach climax flora must happen quickly. The Alltech Seed, Feed, Weed programme (based on the concept developed by Professor Steve Collett) devises a cost-effective means of looking after the microbiota of all commercial poultry species, and hence improving their performance.

The theory goes that we must seed the gut with a probiotic or competitive exclusion product to promote the development of beneficial pioneer flora. We then feed the beneficial organisms with an organic acid, such as Acid-Pak 2-Way, and weed out any potentially pathogenic organisms with a product such as Actigen. A programme such as this helps nurture the beneficial organisms while excluding the 'bad' micro-organisms.

Promoting a healthy microbiota aids the bird with immune modulation. The aim is to dampen the acute phase response while stimulating the protective response, shifting the focus and balance of the immune cells so that they can react efficiently to any challenges. Enhancing the immune focus can be promoted by ensuring an effective biosecurity programme is in place and removing external stimuli that require a response, such as pathogens or homeostatic stresses. This can be achieved through controlling the house environment. Again, this is critical to producing quality hatching chicks, as the effects of negative immune responses are passed down to offspring.

A flock that produces eggs efficiently, while having a beneficial microbiota profile, is irrelevant in breeding flocks if fertility and hatchability are not maintained. Ensuring that the selenium requirements of the flock are met will not only aid immune status, as discussed earlier, but will improve fertility and hatchability too.

Sel-Plex, for instance, has been shown to increase sperm concentration and decrease oxidative stress in sperm tubules, leading to improved male performance through reproductive output. Working to put a robust management programme in place through simple nutritional interventions can help to improve breeder performance and directly influence the quality of the offspring.

The Seed, Feed, Weed programme, through improving microbiota diversity and balance, can help produce quality hatching eggs. When aiming to produce viable offspring, there are many factors to be considered, but immunity and health status are key as they have a critical impact on both parent stock and chicks. The microbiota and its makeup will influence many performance metrics of the bird, such as FCR and immunity. While they cannot be seen with the naked eye, monitoring the microbiota through gut health indicators is key to promoting profitable production.

Once consistent monitoring practices are in place, improvements can be made and measured. There are many ways to improve the gut health of breeding flocks, but economic viability is important, so solutions must offer a solid return on investment. The Seed, Feed, Weed programme is one means of doing so, improving both performance and economic efficiency of breeding flocks to produce quality hatching eggs. ■